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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN DEVICES FOR GOVERNING THE TEMPERATURES OF HEATER HEADS OF HOT GAS ENGINES

(71) We, KOMMANDITBOLAGET UNITED STIRLING (SWEDEN) AB & CO., or Stora Varvsgatan 3, 211 20 Malmö, Sweden, a Swedish body corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a device for governing the temperature of a heater head of a hot gas engine, for example a Stirling hot gas engine.

It is generally desirable to maintain a constant high temperature of the heater head of a hot gas engine. The temperature should be high enough to ensure a high efficiency of the thermodynamic cycle performed by the working gas during operation of the engine, but it should not be so high that there will be any risk of over-heating the material of which the heater head is made. In case the output of the engine is suddenly lowered during operation of the engine, the heater head will suddenly be exposed to less cooling by the working gas. Therefore the rate of combustion must be decreased in order to avoid over-heating. Conversely, if the output is raised, more heat must be supplied in order to compensate for the increased cooling effect of the working gas charge.

One object of the present invention is to provide an improved method of governing the temperature of a heater head of a hot gas engine with a view to ensuring that the method is reliable and gives a quick response to changes in engine output and that it has little or no detrimental influence upon the exhaust emission of the engine, i.e. it should ensure the right ratio between air and fuel at any engine load.

It has been proposed to provide a closed cycle hot gas engine with means such that variations in the temperature of a heater head of the hot gas engine are used to control means for governing the rate of supply of combustion air to a burner for heating the said heater

head by combustion of a fuel, and that the said rate of supply of combustion air to the burner is used to control means for regulating the supply of fuel to said burner.

According to the present invention a device for governing the temperature of a heater head of a hot gas engine comprises a temperature-responsive element giving signals in accordance with the temperature of the heater head, a servo-motor governed by said signals and being connected to regulating means connected to a combustion air blower and governing the rate of delivery of combustion air from said blower, and means responsive to the rate of flow of combustion air from the blower being connected to a fuel-control valve for regulating the flow of fuel for combustion with the air delivered by said blower, and is characterised in that said means responsive to the rate of flow of combustion air comprises a valve arranged in the delivery duct of the blower, the fuel control valve is of a known type such that the rate of fuel delivery is a direct function of the displacement of a part of the fuel-control valve, and a lever transmits forces and movements to this part from the vane.

How the invention may be put into practice is described in more detail with reference to the accompanying drawings, showing by way of example and schematically a hot gas engine provided with a device according to the invention.

Referring to the drawing a hot gas engine has a housing 1 and a heater head 2 which is heated by a burner 3. The temperature prevailing at the heater head 2 is measured by a temperature-responsive element 4 giving signals to a relay 5 energizing a device 6 connected to a choke valve 7 mounted in an air inlet duct 8 of a centrifugal blower 9 driven by a pulley 10 mounted on the engine output shaft. At the delivery side of the blower 9 a disc-shaped vane 11 is supported at one end of a two-armed lever 12, the other end of which lever contacts a governing stem of a fuel delivery valve 13. Fuel is delivered

from the valve 13 to the burner 3 at a rate which is a direct function of the displacement of the stem of the valve 13 by the lever 12.

5 The air delivered by the blower 9 is passed to the combustion chamber of the hot gas engine through a duct 14, and the rate of flow will cause a movement of the disc-shaped vane 11 which is a direct function of the rate of flow of this air.

10 The illustrated device will operate as follows:

In case the engine load is changed—e.g. by changing the mean effective pressure of the working gas or by connecting the working gas charge with a "dead" volume space—the temperature affecting the temperature-responsive element 4 will immediately change. A corresponding signal from the element 4, through the relay 5 and motor 6 will cause a movement of the choke valve 7. Thus a rising temperature will cause a closing movement of the choke valve 7, or conversely a falling temperature will cause an opening movement of the choke valve 7.

25 If a closing movement of the choke valve 7 results in a decrease in the flow of air delivered by the blower 9, the vane 11 with lever 12 and the valve 13 will immediately cause a corresponding change in the rate of the fuel flow to the burner 3. Thus the rate of fuel supply will always be matched to the air supply being fed to the burner 3, ensuring maintenance of the most favourable proportion between fuel and air at any engine load.

35 It will be understood that the device described will operate independently of the engine load and of the system for governing the engine power. Thus if the engine load is kept constant but the engine is running more slowly at a corresponding greater torque this will initially cause a lower speed of the blower 9. Consequently the amount of air delivered will decrease and so will the rate of fuel supply. However, this will cause a decrease of the temperature of the heater head and in turn cause an opening of the choke valve 7 and a correspondingly higher rate of fuel supply.

Thereby the temperature of the heater head 2 is governed by a method in which variations in this temperature affecting the element 4 are used to control means 5, 6, 7 for governing the rate of supply of combustion air to the burner 3, and the rate of supply of combustion air to the burner 3 is used to control means 11, 12, 13 for regulating the supply of fuel to the burner 3.

WHAT WE CLAIM IS:—

1. A device for governing the temperature of a heater head of a hot gas engine, the device comprising a temperature-responsive element giving signals in accordance with the temperature of the heater head, a servo-motor governed by said signals and being connected to regulating means connected to a combustion air blower and governing the rate of delivery of combustion air from said blower, and means responsive to the rate of flow of combustion air from the blower being connected to a fuel-control valve for regulating the flow of fuel for combustion with the air delivered by said blower, characterised in that said means responsive to the rate of flow of combustion air comprises a vane arranged in the delivery duct of the blower, the fuel-control valve is of a known type such that the rate of fuel delivery is a direct function of the displacement of a part of the fuel-control valve, and a lever transmits forces and movements to this part from the vane.

2. A blower according to Claim 1, further characterised in that said blower is driven by the hot gas engine and that the said regulating means is a choke valve which regulates the flow of air through said blower.

3. A device for governing the temperature of a heater head of a hot gas engine, substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

